



Minzu University of China
MATH240 Differential Equations
Summer 2020

Basic Information

Class hours: Monday through Thursday, 2 hours each day

Discussion: Friday, 1 hour (60 minutes)

Review Section: Saturday, 1 hour (60 minutes)

Office Hour: 2 hours (According to professors' teaching plan)

Field trip: According to professors' teaching plan

Credit: 4

Total contact hours: 60 (50 minutes each)

Instructor: Olga Cordero-Brana

Pre-requisite

Calculus I-II

Textbook

Elementary Differential Equations and Boundary Value Problems, by Boyce and DiPrima. Any edition will do.

Other books references:

Differential Equations: An Introduction to Modern Methods and Applications, by James Brannan and William Boyce, 2015 (3rd edition), Wiley

Elementary Differential Equations by William Trench Brooks/Cole Thomson Learning, 2013.

Elementary Differential Equations by Edwards and Penney, 6th edition Pearson, 2008. Ordinary Differential Equations (Dover Books on Mathematics) Revised Edition by Morris Tenenbaum and Harry Pollard.

Recommended

Scientific Calculator-This does not need to be a graphing calculator, but you should have some type of basic scientific calculator that can evaluate exponents, logarithms, etc.

Course Description and Objectives

The laws of nature involving rates of change can be expressed as differential equations. This course focuses on ordinary differential equations (ODEs) and their applications to mechanics, electrical circuits, and biology, as well as the techniques used to solve them.

Student Learning Outcomes

After completing this course, students should be able to:

Classify differential equations based on the techniques for solving them;

Solve those differential equations that are amenable to elementary techniques;

Construct approximate solutions to arbitrary differential equations;

Apply differential equations and their solutions to mechanics, electrical circuits, and biology.

Course Structure

Classes

Classes will be interactive and involve problem-based learning, where students will work on multi-part



problems in-class. These problems will be used to motivate theory and methods, rather than simply presenting procedures to be followed by students. There is growing evidence to show that this kind of approach successfully emphasizes understanding over rote learning. Students will also be encouraged to work together to solve problems, helping to learn from one another and improving communication and reasoning skills. Having to describe your interpretation of a problem to others can really help you to understand things at a deeper level.

Integrity Code

Academic integrity stands at the heart of intellectual life. The academic community is bound by a fundamental trust that professors and students alike undertake and present their work honestly. All work submitted for this course must be your own.

Grading

(Note: NO MAKEUP on any exam, quiz, or class activity.)

40% quizzes, weekly homework and labs, class activities. Class attendance is mandatory (EVERY class is worth at least 5 points. There can be a quiz or other type of activity in every class).

60% Midterm and Final Exam

Grade distribution (percentage using the above weights)

Grade	Score Range	GPA
A+	97-100	4.0
A	94-96	3.8
A-	90-93	3.6
B+	87-89	3.47
B	84-86	3.33
B-	80-83	3.2
C+	77-79	3.07
C	74-76	2.93
C-	70-73	2.8
D+	67-69	2.67
D	64-66	2.53
D-	60-63	2.4
F	<60	0

Weekly Tentative Timeline

Date	Topics
W1 Monday to Friday Unit 1: Solving first order equations After this unit, you should be able to: Classify differential equations by linearity and homogeneity and- Solve first order ordinary differential equations by separation and by integrating factors.	Classification of differential equations Consequences of linearity Separable equations Exactness and integrating factors Modeling with separable equations Homogeneous equations Quiz 1 on Friday
W2 Monday to Friday Unit 1 continued	Homogeneous equations Existence and uniqueness of solutions



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<p>Unit 2: Solving higher order equations After this unit, you should be able to: Solve higher order ordinary differential equations with constant coefficients; Solve boundary value problems involving homogeneous and non-homogeneous equations.</p>	<p>Homogeneous equations with constant coefficients Fundamental solutions of linear homogeneous equations Linear independence and the Wronskian Quiz 2 on Friday</p>
<p>W3 Monday to Friday Unit 2 continued Unit 3: Solving by transformation After this unit, you should be able to: Use Laplace transforms to solve linear differential equations with non-constant coefficients; Express solutions to nonhomogeneous equations as convolutions.</p>	<p>Complex roots of the characteristic equation Repeated roots of the characteristic equation The method of undetermined coefficients The Laplace transform Using Laplace transforms for initial value problems Step functions Midterm on FRIDAY</p>
<p>W4 Monday to Friday Unit 3 continued Unit 4: Solving approximately After this unit, you should be able to: Write power series solutions and approximate solutions using Euler's and related methods.</p>	<p>Discontinuous forcing functions Impulse functions The convolution integral Power series Series near an ordinary point Regular singular points Bessel's equation Euler's method Improvements to Euler's method Quiz 3 on Friday</p>
<p>W5 Monday to Friday Unit 4 continued</p>	<p>Bessel's equation Euler's method Improvements to Euler's method Final Exam on Thursday and Friday</p>